CORRESPONDENCE

Noninvasive ventilation usage time and survival rate in patients with acute respiratory failure: some key insights

To the Editor:

One of the major causes of emergency admissions is acute respiratory failure (ARF) [1]. Noninvasive ventilation (NIV) is increasingly used for ARF management because of its efficacy (particularly in hypercapnic patients), achievable goals and because it can be outside the intensive care unit [2]. The benefits of NIV are still under investigation in various hypoxaemic respiratory failure (HRF) aetiologies, such as asthma, pneumonia, immunosuppression and acute respiratory distress syndrome [1].

We read with great interest the study presented by Hukins *et al.* [3], which for the first time, successfully displays a dose–response relationship between the actual mask-on usage period and hospital survival in ARF patients. Notably, the authors took great efforts to compare their results with previous trials, which mainly investigated the total period of NIV therapy, including both mask-on and mask-off times. The study also provides beneficial data regarding the survival rate and its relationship with therapy intensity calculated as a proportion of mask-on usage from a total NIV period, as well as the association of survival with concomitant patient comorbidities. The large sample size (n=654) collected over 5 years was considered a major advantage of this retrospective study, as it increased the applicability of its findings, especially in patients with hypercapnic respiratory failure (HCRF), who represented ∼91% of the included patients. However, we feel that with regard to the methodology, some key aspects require clarification. First, HCRF and HRF groups are not matched so the study outcomes are mainly based on the HCRF group, with a ceiling effect at 24 h of cumulative mask-on usage. The reliability of the results in hypoxaemic patients is therefore limited and further investigations are needed.

Secondly, the exclusion criteria for acute NIV need to be defined in detail in the methodology. Additionally, the authors determine that a number of patients ceased NIV before clinical stability, which was due to intolerance or ineffectiveness of therapy, but did not illustrate the alternative therapy provided. If those patients were stepped up to a more invasive technique, why was the intubation rate not calculated as a secondary outcome, as in many previous studies [4–6]?

Finally, the authors stated that an inverse dose–response relationship was noted between survival and the intensity of therapy in the HCRF group, and the same was noted in the HFR group but not in a dose–response manner, with the highest mortality seen in patients requiring mask-on proportions of 80–100% of acute NIV therapy. We wonder whether the intubation delay in patients with high disease severity contributed to high mortality, and whether it was possible to avoid such adverse events by early recommendation of mask-on proportions in the first 24 h of admission, consequently avoiding NIV failure in ARF patients [7]. Further clinical trials are needed to confirm these results.

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The possibility of avoiding adverse events by recommending early determination of mask-on proportions in the first 24 h of admission and, consequently, NIV failure in ARF patients https://bit.ly/2T0QYVN

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References

1 David-Joao PG, Guedes MH, Réa-Neto Á, *et al.* Noninvasive ventilation in acute hypoxemic respiratory failure: a systematic review and meta-analysis. *J Crit Care* 2019; 49: 84–91.
2 Scala R, Pisani L. Noninvasive ventilation in acute respiratory failure: which recipe for success? *Eur Respir Rev* 2018; 27: 180029.
3 Hukins C, Murphy M, Edwards T. Dose–response characteristics of noninvasive ventilation in acute respiratory failure. *ERJ Open Res* 2020; 6: 00041-2019.
4 Plant PK, Owen JL, Elliott MW. Early use of non-invasive ventilation for acute exacerbations of chronic obstructive pulmonary disease on general respiratory wards: a multicentre randomised controlled trial. *The Lancet* 2000; 355: 1931–1935.
5 Thys F, Roeseler J, Reynaert M, *et al.* Noninvasive ventilation for acute respiratory failure: a prospective randomised placebo-controlled trial. *Eur Respir J* 2002; 20: 545–555.
6 Brochard L, Mancebo J, Wysocki M, *et al.* Noninvasive ventilation for acute exacerbations of chronic obstructive pulmonary disease. *N Engl J Med* 1995; 333: 817–822.
7 Frat JP, Ragot S, Coudroy R, *et al.* Predictors of intubation in patients with acute hypoxemic respiratory failure treated with a noninvasive oxygenation strategy. *Crit Care Med* 2018; 46: 208–215.

From the authors:

We would like to thank Y.M. Madney and colleagues for their considered comments. The data in our recent study are predominantly related to the hypercapnic group reflecting the demand for noninvasive ventilation (NIV) [1]. We agree that the hypercapnic and hypoxaemic respiratory failure (HRF) cohorts were not matched, which is not unexpected when considering that the pathogensis of these two entities are very different. We have previously demonstrated that there are poorer outcomes with hypoxaemic than hypercapnic respiratory failure in a respiratory high dependency unit [2], and there is an increasing proportion of patients with HRF managed in high dependency units. We believe that our recent study indicates that the two entities have different dose–response relationships for NIV but agree that a larger HRF cohort is required to determine the dose characteristics of this group.

Y.M. Madney and colleagues also discussed the potential impact of the methodology on the outcomes, specifically the exclusion criteria for acute NIV, as well as the potential confounding factor of escalation to therapy and the possible impact of delayed intubation. In our institution, direct intensive care unit (ICU) admission for respiratory failure only rarely occurs; for example, where early intubation is imminently required or in the presence of multi-system disease where other system support, including inotropic, is

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required. The main absolute contraindication for acute NIV is patient preference (where end-of-life planning precludes NIV) but NIV would not be offered in patients where this therapy is considered futile (for example, progressive end-stage interstitial lung disease without an acute exacerbation). We do not believe that escalation of care, including intubation or delay of intubation, affected our outcomes. First, only 12 (<2%) of the whole cohort of 654 patients were transferred to ICU following NIV in the high dependency unit. Secondly, of the 37 patients who ceased NIV out-of-protocol (before clinically stable), only one was transferred to the ICU. This patient did not receive invasive ventilation and survived to discharge. Finally, NIV was the ceiling of care in 211 patients (32% of the cohort) due to preferences or severity of comorbidities. These patients were not considered for escalation of care beyond acute NIV. Therefore, we believe that our findings were not biased by these methodological issues.

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References

1 Hukins C, Murphy M, Edwards T. Dose–response characteristics of noninvasive ventilation in acute respiratory failure. *ERJ Open Res* 2020; 6: 00041-2019.
2 Hukins C, Wong M, Murphy M, *et al.* Management of hypoxaemic respiratory failure in a respiratory high-dependency Unit. *Intern Med J* 2017; 47: 784–792.